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Changing career paths in environmental, soil, and water science and crop management: Survey results

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ABSTRACT

Periodic assessment of goals is critical to maintaining a successful academic program. Two surveys were designed and distributed to alumni and potential employers of graduates of the Department of Crop, Soil, and Environmental Sciences (CSES) in the summer of 2002 to assess the profitability of advanced degrees in terms of earning potential and to determine sectors of the workforce currently employing department graduates. The CSES Alumni Satisfaction Survey was sent to 792 department alumni, including graduates of the previous Agronomy program as well as the current Crop, Soil, and Environmental Sciences program. The CSES Employer Survey was distributed to 281 professionals and provided valuable information concerning current workforce requirements of college graduates. Survey results suggested that alumni career paths are changing; alumni are employed quickly, but fewer alumni are self- or government-employed while more are working in industry positions. Results from the CSES Employer Survey suggest that alumni are earning salaries typical for this region. Alumni salaries also indicated that advanced degrees are profitable in that the number of alumni reporting higher-end salaries increased to a greater extent among M.S. and Ph.D. graduates. These results will be used to enhance recruitment of prospective students and to improve advisement of current departmental students. Ultimately, the CSES Department hopes to increase enrollment, student satisfaction with degree programs, and career preparedness.

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MEET THE STUDENT-AUTHOR

Thalia M. Madewell

I am a 1999 graduate of Muskogee High School in Muskogee, Okla. After visiting several universities in Oklahoma, I began my undergraduate education as an environmental, soil, and water science major at the University of Arkansas in the fall of 1999 and immediately knew that I had made the right choice. I was awarded several academic scholarships during my time at the University of Arkansas including the University Scholarship, Bobby R. Wells Memorial Scholarship, Adair Scholarship in Agronomy, Dale and Wilhelmina S. Hinkle Scholarship, and the Harold and Iva Hicks Scholarship. I was also awarded a Dale Bumpers Undergraduate Research Grant to conduct work on this project. In addition to academic interests, I have tried to remain active in extracurricular activities such as the Crop, Soil, and Environmental Sciences Undergraduate Club and I am also an alumnus of Kappa Delta Sorority.

I began work on this project in May 2002 and was afforded the opportunity to present my research to the Arkansas Environmental Federation, the Arkansas Academy of Science, and the Crop, Soil, and Environmental Sciences Departmental Seminar. Throughout my work, I have gained invaluable experience in conducting, preparing, and presenting research. I graduated in May 2003 and hope to begin work on a Master of Science degree in Crop, Soil, and Environmental Sciences in 2004.

INTRODUCTION

All academic programs need periodic reviews to evolve in response to advances in technology, changing societal needs, and overall increased states of knowledge. Assessment is especially needed in higher education to provide accountability for funds, to ensure a well-trained workforce, and to improve the effectiveness of academic programs (Miller et al., 1998). A comprehensive review including department graduates, as well as their current and potential employers, can prove a sound tool in judging overall program effectiveness. While employers can attest to the quality of graduates and, therefore, the quality of a program, alumni offer a unique perspective to judge the strengths and weaknesses of a program (Cole and Thompson, 2002; Miller et al., 1998). Alumni of agriculturally related programs are particularly important targets because the degree of satisfaction former students have with their education is an indication of the success of an agricultural program (Barkley, 1993). If students do not receive what they perceive to be a worthwhile investment, then agricultural programs will inevitably lose students to other more valuable programs.

Other academic institutions have recognized the need to maintain an on-going dialogue with potential employers to gauge the quality of graduates' knowledge, skills, and thus the overall quality of the academic program (Cole and Thompson, 2002). According to Andelt et al. (1997), many of the "hot markets" and profitable careers students expect upon graduation are not accessible because "college graduates are unprepared to fulfill the needs of their employers." Furthermore, they contend that educating students for a career in agriculture/natural resources demands not only greater technical skills, but also a more holistic perspective on interaction with society (Andelt et al., 1997).

The Crop, Soil, and Environmental Sciences (CSES) Department at the University of Arkansas currently offers undergraduate Bachelor of Science (B.S.) majors

in Crop Management (CPMG) and Environmental, Soil, and Water Science (ESWS). Previous efforts by the University of Arkansas CSES Department to evaluate academic programs and their effectiveness in terms of graduate employment and earning potential have included alumni surveys and senior exit interviews. Although the department continues to conduct exit interviews with graduating seniors, the last departmental alumni survey was distributed in 1988 (Davis et al., 1991), prior to the establishment of the ESWS degree and Crop Management revisions.

Therefore, as part of the CSES Department's current assessment, two surveys were designed and distributed to alumni and employers in the summer of 2002. The CSES Alumni Satisfaction Survey was sent to 792 departmental alumni, including graduates of the past Agronomy program as well as the current Crop, Soil, and Environmental Science programs. Goals of the alumni survey included assessment of advance degree profitability in terms of earning potential and to determine sectors of the workforce actively recruiting and employing department graduates. The alumni survey was designed with the following specific objective: to obtain demographic, education, and career information. In addition, a comparison of past graduate salaries and opinions regarding employment with those of more recent alumni (1992-2002) will provide important comparative information of students from the past Agronomy Department to the restructured Crop, Soil, and Environmental Sciences Department. The CSES Employer Survey was distributed to 281 environmental and crop science professionals representing various sectors of the workforce including government agencies, private firms, and academic institutions. The employer survey was designed with the following specific objectives: 1) to evaluate the importance of selection criteria for employee hiring, 2) to obtain job descriptions and earning potentials, and 3) to recruit employers interested in interacting with the CSES Department at the University of Arkansas.

MATERIALS AND METHODS

Survey Construction

A survey format was followed as presented by Sheatsley in the Handbook of Survey Research (1983) consisting primarily of closed questions such as multiple choice, rank, rate, and categorical questions. The survey was two pages, front and back, and consisted of only six open-answer questions. Open-answer questions were kept to a minimum due to their ability to elicit repetitious and often irrelevant material (Sheatsley, 1983). Data from three of the CSES Alumni Satisfaction sections will be reported here: Demographics, Educational Background, and Employment. Data from two of the CSES Employer Survey sections, Company Information and Student Advising, will also be included.

Survey Disbursement and Response Rates

The CSES Alumni Satisfaction Survey was distributed in August of 2002 to 792 alumni as an insert in the CSES Department's annual newsletter. Repeated efforts were made encouraging alumni to return completed surveys. In September 2002, an on-line address was created whereby respondents could conveniently complete and submit the survey electronically. Survey responses were received electronically and by mail through December 2002. One hundred and three alumni completed and returned surveys, resulting in a 13% response rate. Thirty-nine responses were received electronically and 64 by mail. Seventy-five percent of those who submitted their survey electronically were post-1992 graduates.

A contact list for the CSES Employer Survey was developed in resemblance to similar surveys administered by other agricultural colleges (Bekkum, 1997; Cole and Thompson, 2002). For example, former and current employers of department graduates, a national list of soybean board members, and the membership list for the Arkansas Environmental Federation were used to garner a potential contact list. Recipients represented various sectors of the workforce including education, local and state governmental agencies, as well as public and private industries. Fifty-three percent of employer survey recipients were located in Arkansas, with the remaining 47% generally located in surrounding states and other states such as Iowa, Indiana, and Illinois. All employers who did not respond within a month of the initial disbursement were contacted again by letter or email. An on-line address was specified where the respondents could opt to complete and submit the survey electronically.

Thirty-one completed employer surveys were received from an initial sample size of 281, resulting in an 11% response rate. Surveys of similar length and content have documented response rates in this area, ranging from 5% to 20% (Wolf and Schaffner, 2000). The relatively low percentage of responses could be an indication that employers who did respond are more interested in educational quality than most, thereby indicating a response bias in the dataset (Wolf and Schaffner, 2000). Over half of the respondents completed the optional section volunteering to interact/collaborate with the department, further supporting the idea that respondents had heightened interest in the quality of higher education.

Statistical Analysis

Frequencies, relative sample abundances, means, ranges, and standard deviations were calculated depending on question type. For some questions, respondents were asked to rate their agreement with statements on a scale from 1 to 5, 5 being "strongly agree" and 1 being "strongly disagree." In these situations, responses above 3 were considered positive and below 3 were considered negative.

RESULTS AND DISCUSSION

Demographics and Educational Background

Despite the fact that the department has changed its name and degree programs over the past 15 years, the demographics of survey respondents were similar to alumni survey respondents in 1988. Eighty-one percent of current survey respondents were male and 97% were U.S. citizens. In 1988, 85% of alumni respondents were male and 95% were U.S. citizens (Davis et al., 1991).

A lower percentage of alumni responding to the 2002 survey (75%) obtained advanced degrees as compared to 85% of those who completed the 1988 survey. The high number of respondents holding advanced degrees is interesting to note given that, during exit interviews, 67% of graduating seniors did not plan to attend graduate school, but rather expected to secure employment immediately upon graduation (Bacon et al., 2000). Bachelor of Science graduates may decide to continue their education, seeking an advanced degree, after working for a period. Of the 63 respondents who received their B.S. at the University of Arkansas, 71% obtained a M.S. and most of these students stayed at the University of Arkansas. Thirty-two percent of these B.S. graduates also went on for a Ph.D., but only 8% received their Ph.D. from the University of Arkansas. Thirty-eight percent of alumni respondents graduated in the past 10 years. Of this group, 44% obtained a M.S. and 10% received a Ph.D. Given the relatively small percentage of alumni who responded to the survey, the high percentage of advanced degree respondents may not be indicative of the total alumni population. Advanced degree holders may be more likely to complete and return the survey, and could represent a bias in survey responses.

Employment

Prospective students frequently question the department recruiter and faculty about potential career opportunities and earnings. To gather this data, alumni and employer respondents were asked about their employment and to disclose salary information. For a first job following graduation, 35% of CSES alumni began working in industry, 36% entered educational positions (most of these were attending graduate school), and 22% obtained jobs with governmental organizations (Table 1). Of those who entered industry positions, 4% were consultants, 13% went into sales, and the remainder held science-related positions such as technicians, field scientists, and researchers. Very few CSES alumni were self-employed. Of the 5% that indicated that they were self-employed, 4% were farmers.

Table 1. Percentage of Crop, Soil and Environmental Sciences alumni employed in different areas following graduation (first job) and in current positions (current jobs).

Area of employment	First job (%)	Current job (%)
Government	22	14
Industry	35	32
Education	36	38
Self	5	6
Other	1	1
Retired	0	9

Alumni were also asked to reveal their current job titles. There was a similar distribution among areas of employment for alumni, except for a notable decrease in governmental positions and the establishment of a new category for those who have retired (Table 1). Current positions differed from initial positions within higher education, as most current job titles had to do with faculty or administrative positions rather than graduate degree-seeking positions. In industry, most job titles were associated with management and executive positions, rather than sales and technician level positions.

Alumni career paths appear to have changed since the 1988 survey. Results from the current survey showed fewer alumni were working in government or were self-employed, and a higher number of respondents went into industry. Factors such as a burgeoning regional population, government downsizing, an influx of industry into the region, as well as the general consolidation of agriculture may all have contributed to the evolving job market. A significant change in the CSES Department's curricula and focus may have also been a factor influencing subsequent career decisions of alumni.

Starting annual salaries were tabulated only for those respondents having received their most advanced degree in the past 10 years (1992 to 2002). Starting salaries for B.S. respondents averaged $23,140, approximately $8,000 less than M.S. respondents (Table 2). As expected, Ph.D. respondents reported the highest average start-

Table 2. Annual starting salaries for Crop, Soil and Environmental Sciences alumni graduating between 1992 and 2002.

Salary information	Alumni with B.S.	Alumni with M.S.	Alumni with Ph.D.
Average	$23,140	$31,290	$42,670
Standard deviation	$7080	$9320	$16,010
Minimum	$13,000	$14,500	$27,000
Maximum	$38,000	$46,000	$59,000
Sample size	18	17	3

ing salary at $42,670. Salaries from the 2002 survey were compared to salaries from the 1988 survey to determine if current graduates are financially "better off" as compared to their peers of 15 years ago. Based on an average annual inflation rate of 3.1% (Annualized Inflation Rates, 2003), starting salaries reported in 1988 would be equivalent to $30,800, $36,800, and $50,300 for B.S., M.S., and Ph.D. degree holders, respectively. The average starting salary for alumni graduating since 1992 was $28,330 (n = 38), after four individuals earning less than $5000 were removed from the dataset. This amount is similar to the average starting salary of $28,190 as reported in the 1988 survey (Davis et al., 1991). However, when adjusted for an average annual inflation rate of 3.10%, that salary in 1988 would be equivalent to $44,560 today, indicating that average starting salaries for our alumni have not kept up with inflation (Annualized Inflation Rates, 2003). However, compared to what was reported in the CSES Employer Survey, salaries appear to be within range of what can be expected in this region. Employers indicated that starting salaries at their places of employment ranged from less than $20,000 to nearly $60,000, with 72% of employers indicating initial starting salaries in the $20,000-$39,999 range. Twenty-one percent of employer respondents, primarily individuals representing the industry sector, indicated starting salaries were in the $40,000 to 59,999 range.

Salaries were categorized with respect to the highest degree earned in part to determine the profitability of investment in an advanced degree. Current salaries ranged from less than $30,000 to $129,999 for all alumni (Table 3). Alumni were not questioned as to the number of years they have been employed in their current position; therefore, salary ranges simply indicate a composite of the total response group. The number of alumni reporting higher-end salaries increased to a greater extent among those with M.S. and Ph.D. degrees (Table 3). For example, only 4% of B.S. respondents, compared to 17% of M.S. and 29% of Ph.D. respondents, indicated they earned annual salaries greater than $80,000.

Table 3. Percentage of Crop, Soil and Environmental Sciences alumni earning salaries within specified ranges (n = 24 for B.S., 35 for M.S., and 31 for Ph.D.).

Salary Category	% Alumni with B.S.	% Alumni with M.S.	% Alumni with Ph.D.
Less than $30,000	25	28.5	10
$30,000-49,999	42	28.5	19
$50,000-79,999	29	26	42
$80,000-99,999	0	14	19
$100,000-129,999	4	3	10

Therefore, not only were starting salaries higher for advanced degree holders, but it also held true that those with M.S. and Ph.D. degrees had the greatest potential to advance their salaries. Current salaries disclosed in the employer survey also ranged from $30,000 to upwards of $100,000 (data not shown), again indicating that alumni salaries are representative of those in this region.

Alumni and employers were asked their opinions regarding whether a B.S. degree is sufficient for a successful career. While alumni felt that one could be successful with a B.S. in Environmental, Soil and Water science (average value of 3.2; where values greater than 3 were considered positive), they were less inclined to agree that a B.S. was sufficient for students majoring in Crop Management (average value of 2.9). This supports the observation from salary data that one can obtain employment with adequate salaries, but potential for advancement is limited with only a B.S. degree. Employers were more likely than alumni to view a B.S. as sufficient for a successful career by assigning values of 3.4 for ESWS and 3.6 for CPMG majors.

Survey participants were asked to indicate their opinions with regard to future job prospects. Most alumni obtained their first job after graduation within a short period. Sixty-one percent of respondents indicated that they obtained their first job immediately after or even before the completion of their last degree and only 6% reported needing more than a year to find a suitable position (n = 89, data not shown). Alumni agreed that jobs should be available in the future for ESWS graduates (average agreement value of 3.9), and were also optimistic about positions related to CPMG majors (average agreement value of 3.5). However, some participants did comment in the surveys that consolidation and downsizing in agronomic fields is a concern. Employers were also generally positive, but more likely to encourage a degree in ESWS (average value 3.7) as compared to a CPMG degree (average value 3.0). Despite the positive responses, 2002 respondents seemed to be slightly less optimistic than 15 years ago when approximately 82% of 1988 respondents indicated that they felt a departmental graduate would be "able to find jobs in the next 4 to 6 years" (Davis et al., 1991). In conjunction with this trend, 71% of respondents in the employer survey indicated that hiring had not occurred at their place of business in over a year. Low employee turnover and low demand were the only two explanations provided for the low hiring rate.

Conclusions

Based on alumni and employer responses, CSES graduates are employed quickly and appear to be earn-

ing competitive salaries. As expected, Ph.D. respondents reported the highest average starting salary, almost $20,000 more per year than B.S. graduates. Furthermore, the number of alumni reporting higher-end salaries increased to a greater extent among M.S. and Ph.D. graduates, thereby affirming the profitability of obtaining an advanced degree. Although the CSES Department at the University of Arkansas has undergone significant changes over the past 15 years, little has changed with regard to student demographics. However, alumni career paths are continuing to evolve, possibly in response to departmental changes as well as regional changes in the workforce. Responses from both alumni and employers have provided valuable insight for improvement of student advising and recruitment. Continual program and graduate evaluation is imperative for graduating competent, competitive, and satisfied individuals.

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